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Vadiraja Bhatt

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EXAMINER

AHMED, HAMDY S

ART UNIT

PAPER NUMBER

2188

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DELIVERY MODE

10/31/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.



<b>Office Action Summary</b>	Application No. 10/710,381	Applicant(s) BHATT ET AL.	
	Examiner Hamdy S. Ahmed	Art Unit 2188	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 September 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-45 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07/06/2004 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |



### **DETAILED ACTION**

Claims 1-45 are pending.

Claims 22 and 23 are withdrawn from the objection.

Claim 23 is withdrawn from USC 101 rejection.

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5-26 and 28-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alsup (US No: 20040103251 A1) in view of Darcy (US No: 7,124,249 B1).

As to claim 1, Alsup teaches a method for extended memory (the memory is extended by having more than one cache, see abstract, lines 5 - 7) support in a database system (see figure 3, data B1, data B2, and data B3) having a primary cache for storing a database page (see L1 cache, paragraph 5, line 2); when the primary cache is full, replacing database pages from the primary cache using the secondary cache (see paragraph 6, if a miss occurs in the L1...lines 5-8, and paragraph 44, lines 2-6); in response to a request for a particular database page, searching for the database particular page in the secondary cache if the particular database page is not found in the primary cache (see paragraph 6, lines 3-6), and swapping the particular database page found in the secondary cache with a database page in the primary cache, so as to replace a database page in the primary cache with the particular database page from the secondary cache (see paragraph 6, lines 11-15). The Alsup reference does not teach: using a memory mapped file, creating a secondary cache in system memory available to the database system; mapping a virtual address range to at least a portion of the secondary cache if the particular database page is found in the secondary cache, determining a virtual address in the secondary cache where the particular database page resides based on the mapping. The Darcy reference teaches using a memory mapped file, creating a secondary cache in stem memory



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available to the database system (see column 5, lines 9-16); mapping a virtual address range to at least a portion of the secondary cache if the particular database page is found in the secondary cache (see column 5, lines 22-32), determining a virtual address in the secondary cache where the particular database page resides based on the mapping (see column 5, lines 17-32). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to have modified the Alsup system by using the Darcy system reference to create a software cache, because the implementation of software cache is not limited to one aspect, but it can be used in numerous of others applications, for sharing a volume of storage in a distributed manner. The software cache also, is programmed to operate like a set associative hardware cache to allow efficient access to block of data in the cache (see column 28, lines 60-67, and column 29, lines 1-10).

As to claim 2 Alsup discloses wherein said creating step includes creating the secondary cache. The Darcy reference teaches wherein said creating step includes creating the secondary cache (see figure 1, L2, which communicates with L1 data cache 101 B and another shared memory file).

As to claim 3, Alsup discloses wherein the shared memory file system is available as part of an operating system on a computer platform on which the database system is running (see figure 2, system memory communicates with the data base, as part of operating system).

As to claim 5, The Alsup discloses a method wherein said mapping step includes using a memory mapped file function. The Darcy reference teaches (see paragraph 21, line 10).

As to claim 6, Alsup discloses wherein the memory mapped file function is available as part of an operating system on a computer platform on which the database system is running (see figure 2).

As to claim 7 Alsup discloses wherein said creating step includes creating the secondary cache on external memory available to the database system (see (see figure 2, L2 is available to data B1 to data B3).

As to claim 8 Alsup discloses wherein said swapping step includes consulting a least recently used (LRU) list maintained for the primary cache to determine the database page to be moved to the secondary cache (see paragraph 6, lines 8-15).

As to claim 9, Alsup discloses wherein said swapping step further comprises copying the database page to be moved to the secondary cache to a temporary buffer (each cache has temporary buffer to store database page see paragraph 38, lines 1-4).



As to claim 10 Alsup discloses wherein said swapping step further comprises moving the particular database page from the secondary cache to address of the database page in the primary cache to be moved to the secondary cache (see paragraph 6, lines 8-15).

As to claim 11 wherein said swapping step further comprises moving the database page from the temporary buffer to the secondary cache each cache has temporary buffer to store database page (see paragraph 38, lines 1-4).

As to claim 12, Alsup discloses wherein further comprising: adding the replaced database page to a most recently used end of a most recently used/least recently used (MRU/LRU) list maintained for the secondary cache (this is a normal transfer between the first cache and the second cache).

As to claim 13 Alsup discloses wherein said replacing step includes maintaining a least recently used (LRU) list for the primary cache and selecting the database page to be moved to the secondary cache based on said LRU list (this is a normal transfer between the first cache and the second cache). As to claim 14 Alsup discloses further comprising: providing a washing mechanism in the secondary cache for writing database pages in the secondary cache to disk (see paragraph 28, lines 10-12).

As to claim 15, Alsup discloses wherein a database page is written from the secondary cache to disk in response to copying a database page from disk to the primary cache (see paragraph 6, lines 8-15).

As to claim 16, Alsup discloses wherein the database page written from the secondary cache to disk is selected, based at least in part, on a most recently used/least recently used (MRU/LRU) list maintained for the secondary cache (see paragraph 48, lines 1-5).

As to claim 17, Alsup discloses wherein said replacing step includes determining database pages to be maintained in the secondary cache (see paragraph 5, lines 12-14).

As to claim 18 Alsup discloses wherein said determining step includes determining database pages to be maintained in the secondary cache based, at least in part, on workload of the database system (see figure 2, where the address is maintained between L2 and database).

As to claim 19, wherein said replacing step includes sub steps of: moving a database page from the primary cache to the secondary cache; and reading a database page into the primary cache from disk (if a miss occurs in the L1, lines 5-8, and paragraph 44, lines 2-6).

As to claim 20 Alsup discloses wherein said sub step of moving a database page from the primary cache



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includes selecting a database page from the primary cache based on a least recently used (LRU) list maintained for the primary (see paragraph 48, lines1-12).

As to claim 21 Alsop discloses wherein said sub step of moving a database page from the primary cache includes selecting a location for the database page in the secondary cache based on a most recently used/least recently used (MRU/LRU) list maintained for the secondary cache (see paragraph 48, lines1-12).

As to claim 22, Alsop discloses further comprising: storing on a computer-readable medium processor-executable instructions for performing the method of claim 1 (see figure 1).

As to claim 23, Alsop discloses further comprising: down loading a set of processor-executable instructions for performing the method of claim 1 (see figure 3).

As to claim 24, Alsop discloses database system providing extended memory support, the system comprising: a primary cache (see L1 cache, paragraph 5, line2) for maintaining data pages used by the database (see figure 2, L2 is available to data B1 – B3) system in addressable memory available to the database system; a secondary cache (see L2 cache, paragraph 5, line1), created in system memory using a memory mapped file, for maintaining data pages replaced from the primary cache (see paragraph 47, lines 4- 7) in extended memory available to the database system; a search module for receiving a request from a user for a particular data page and determining whether the particular data page is in secondary cache if the particular data page is not in the primary cache; and a module for replacing a data page in the primary cache with the particular data page from the secondary cache if the particular data page is found in the secondary cache (see paragraph 47, lines 4-10).

As to claim 25, Alsop discloses wherein the secondary cache is implemented using a shared memory file system (the secondary cache communicates with the primary cache and the memory system, which constitutes a shared memory system, see figure 3).

As to claim 26, the Alsop reference teaches wherein the shared memory file system is available as part of an operating system on a computer platform on which the database system is running (see figure 2, where the shared memory file system communicates with the database system (data B0 – B3) on a common computer platform).



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As to claim 28, Alsup discloses wherein the secondary cache is mapped to the extended memory using a memory mapped file function (the memory is extended by having more than one cache see figure 2, L2 is communicates with system memory)

As to claim 29, Alsup discloses wherein the memory mapped file function is available as part of an operating system on a computer platform on which the database system is running (see figure 2, system memory communicates with the database as part of one operating system).

As to claim 30, Alsup discloses wherein the secondary cache is created on external memory available to the database system (see figure 2, L2 communicates with system memory).

AS to claim 31, Alsup discloses wherein the primary cache includes a least recently used (LRU) list for determining data pages to be more to the secondary cache (this is normal operation see paragraph 48, lines 1-12

AS to claim 32, Alsup discloses wherein the module for replacing consults the LRU list for selecting the data page to be moved to the secondary cache (this is normal operation see paragraph 48, lines 1-12).

As to claim 33, Alsup discloses wherein the module for replacing copies the data page to be moved to the secondary cache to a temporary buffer (each cache has temporary buffer to store database page see paragraph 38, lines 1-4).

As to claim 34, Alsup discloses wherein the module for replacing moves the particular data page from the secondary cache to address of the data page in the primary cache to be moved to the secondary cache (see paragraph 47, lines 4-10).

As to claim 35, Alsup discloses wherein the module for replacing moves the data page from the temporary buffer to the secondary cache (each cache has temporary buffer to store database page see paragraph 38, lines 1-4)

As to claim 36, Alsup discloses wherein the secondary cache includes a most recently used/least recently used (MRU/LRU) list and the module for replacing adds the data page moved to the secondary cache to the most recently used end of said MRU/LRU list (see paragraph 47, lines 10-12).

As to claim 37, Alsup discloses further comprising: a washing mechanism in the secondary cache for writing data pages in the secondary cache to disk (see paragraph 28, lines 10-12).

AS to claim 38, Alsup discloses wherein the washing mechanism writes a data page in the secondary cache to disk in response to copying a data page from disk to the primary cache (see L2 figure 2, to disk in response to



copying a data page from disk to the primary cache (see figure 2, and paragraph 47, lines 6-9).

As to claim 39, Alsup discloses wherein the washing mechanism selects the data page from the secondary cache based, at least in part, on a most recently used/least recently used (MRU/LRU) list maintained for the secondary cache (see paragraph 47, lines 10-12).

As to claim 40, Alsup discloses wherein the module for replacing determines data pages to be maintained in the secondary cache (see paragraph 6, lines 11-12).

As to claim 41, Alsup discloses further comprising: a module for reading a page into the primary cache from disk (see paragraph 25 lines 1-3).

As to claim 42, Alsup discloses wherein the module for reading selects a data page from the primary cache to be moved to the secondary cache if the primary cache is full (see paragraph 7, lines 10-13).

As to claim 43, Alsup discloses wherein the module for reading selects the data page based on a least recently used (LRU) list maintained for the primary cache (see paragraph 48, lines 10-13).

As to claim 44, Alsup discloses wherein the module for reading selects a location in the secondary cache for the data page to be moved from the primary cache (see paragraph 48, lines 10-15).

As to claim 45 Alsup discloses wherein the module for reading selects the location in the secondary cache based on a most recently used/least recently used (MRU/LRU) list maintained for the secondary cache (see paragraph 48, lines 10-13)

Claims 4 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alsup (US No: 20040103251 A1) in view of Austin et al. (US No: 20030162544 A1).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.



Claims 4 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Darcy (US No: 7,124,249 B1). in view of Austin et al. (US No: 20030162544 A1).

As to claim 4, Darcy reference teaches all the limitation of claim 1-3 as the above, but Darcy reference does not teach, the use of a Linux operating system. The Austin reference teaches the use of a Linux operating system (see paragraph 58 lines 1-10). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to have modified the Darcy system by using the Austin system reference by using a Linux operating system, because is widely used as the operating system for a number of different applications. Accordingly, the system can implement a wide variety of standard operating software for network servers and the like, as well as allowing third parties the opportunity to modify existing software and develop their own software.

As to claim 27, Darcy reference teaches all the limitation of claim 26, as the above, but Darcy reference does not teach, the use of a Linux operating system. The Austin reference teaches the use of a Linux operating system (see paragraph 58 lines 1-10). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to have modified the Darcy system by using the Austin system reference by using a Linux operating system, because is widely used as the operating system for a number of different applications. Accordingly, the system can implement a wide variety of standard operating software for network servers and the like, as well as allowing third parties the opportunity to modify existing software and develop their own software.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-45 have been considered but are largely moot in view of the new ground(s) of rejection.

With respect to the first argument, the Darcy reference teaches using a memory mapped file, to create a secondary cache in system memory available to the database system because it describes using a variety of hashing techniques for mapping addresses into the software cache, thereby creating cache entries (see Darcy, column 5, lines 9 - 16).



With respect to the second argument, Darcy discloses a multi-cache arrangement with various possible embodiments that do not have to include by necessity storage resources such as disks; rather, Darcy describes a variety of cache types possible, as well as other techniques (e.g., different hashing protocols for each cache) for increasing the likelihood of a hit (see column 30, lines 4 – 14).

With respect to the third argument, Darcy discloses extending memory by mapping addresses of data found in a shared logical volume into a local secondary cache (see column 12, lines 65 – 67, and column 13, lines 1 – 13).

With respect to the fourth argument, Darcy's system allows for a variety of cache embodiments, one of which allows for addresses of blocks in a shared logical volume to be stored as entries in a cache associated with the cache in which the blocks are stored, see column 29, lines 22 – 33).

With respect to the fifth argument, the secondary cache extends the memory and allows for storage of data, instructions, addresses, etc. in system memory in logical volumes; the described storage system is appropriate for a wide range of entry types, including database pages (see column 5, lines 17 – 32). For the reasons given above, the rejection of independent claim 1 is upheld.

With respect to the sixth argument, Darcy discloses the export of logical volumes among nodes in a network, which constitutes a shared memory file system provided by the host node operating system (see column 4, lines 1 – 14).

With respect to the seventh argument, Darcy discloses alternative methods of dynamically rearranging cache configuration to maximize performance by keeping entries used most often in locations in which they can be accessed most quickly (see column 5, lines 33 – 60).

For the reasons given above, the rejection of claims 1 – 3, 5 – 26, and 28 – 45 is maintained.

With respect to the eighth argument, Darcy discloses a method using a memory mapped file to create a secondary cache in system memory available to the database system because it describes using a variety of hashing techniques for mapping addresses into the software cache, thereby creating cache entries (see column 5, lines 9 – 16). Darcy also discloses extending memory by mapping addresses of data found in a shared logical volume into a local secondary cache (see column 12, lines 65 – 67, and column 13, lines 1 – 13). Darcy's system further allows for a variety of cache embodiments, one of which allows for addresses of blocks in a shared logical volume to be stored as entries in a cache associated with the cache in which the blocks are stored, see column 29, lines 22 – 33). The



secondary cache extends the memory and allows for storage of data, instructions, addresses, etc. in system memory in logical volumes; the described storage system is appropriate for a wide range of entry types, including database pages (see column 5, lines 17 – 32). Darcy discloses the export of logical volumes among nodes in a network, which constitutes a shared memory file system provided by the host node operating system (see column 4, lines 1 – 14). Darcy discloses alternative methods of dynamically rearranging cache configuration to maximize performance by keeping entries used most often in locations in which they can be accessed most quickly (see column 5, lines 33 – 60).

For the reasons give above and by virtue of the dependence of claims 4 and 27 on the independent claims already discussed, the rejection of claims 4 and 27 is maintained, as is the rejection of independent claims 1 – 3, 5 – 26, and 28 – 45.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hamdy S. Ahmed whose telephone number is 571-270-1027. The examiner can normally be reached on M-TR

7:30-5:00pm and Every 2nd Friday 7:30-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hung Sough can be reached on 571-272-4199. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HA

Hamdy Ahmed

10/28/07

Jasmine Song

Primary Examiner